

THE HUMAN PINWORM  
ENTEROBIUS VERMICULARIS (LINNAEUS, 1758) LEACH 1853

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BACKGROUND:

The pinworm is a nematode parasite which can affect the welfare of people in many walks of life whether in agriculture, military, business, etc. This publication was prepared with the belief that the subject has sufficient human interest value to merit distribution as a Nematology Circular.

Pinworms have been intestinal parasites of man for at least 10,000 years. Eggs of Enterobius vermicularis (Linnaeus, 1758) Leach 1853, found in human coprolites (fossilized feces) and radio-carbon dated at 7,837 B.C. were recovered from caves in Utah, which were occupied by man as early as 10,000 B.C. A survey in 1965 indicated that 37-57% of children in the United States could be infected. The Florida Department of Health and Rehabilitative Services reported that 1,519 positive pinworm identifications were made at their diagnostic laboratories in 1974.

Pinworm distribution is worldwide, but more prevalent in Europe and North America. Infections focus where bathing and daily change of clothing are infrequent as a result of cold climate or careless personal hygiene. Infections are more prevalent in children; especially if they are crowded when sleeping or at school. Under similar conditions, whites have a higher infection rate than blacks.

E. vermicularis is regarded as a parasite of humans only, with man as the definitive host. However, pinworms have also been reported infecting the Norway rat, black rat, gibbon, chimpanzee, and pig. It is widely believed that dogs are hosts; however, a literature review by Macchioni, published in 1975 indicates that they are not true hosts.

DESCRIPTION:

Adults are white and spindle-shaped. Males measure 2-5 x 0.1-0.2 mm and females 8-13 x 0.3-0.5 mm at their greatest diameters. The head has 3 lips and a pair of wing-like cephalic alae which appear as bladder-like expansions of the cuticle.

Females taper at each end. The transparent pointed tail is about 1/3 of the body length. The vulva is almost 1/3 of the total body length from the head. Narrow bilateral flanges extend from nerve ring to anus, forming 2 crests which help to identify females in cross section. Females can be identified by size, cephalic alae, a long clear tail, and distinctive eggs in the uterus.

Males are less numerous. The tail has a sharp ventral curve and ends abruptly less than a body's width from the cloaca. The caudal alae are reduced and hard to see. The spicule is single and relatively long (70  $\mu$ ).

Eggs measure 50-60 x 20-30  $\mu$ , and are clear, elongate, asymmetrical ovals with one side distinctly flattened. The eggs have a sticky outer layer and will readily adhere to each other and to debris.

LIFE CYCLE:

The life cycle is usually completed in 15-43 days and begins when infective eggs are swallowed after ingestion or inhalation. They hatch in the beginning of the small intestine and mature after attaching to the wall of the large intestine. Copulation occurs in the lower part of the small intestine. Females exit via the anus at night and may deposit 4,000-16,000 eggs on the perianal skin, usually 15-43 days after infective eggs have been swallowed. After ovipositing, females may die or re-enter the intestine. Eggs become infective after 6-48 hours. Some eggs may hatch on the perianal skin and the larvae may enter the anus to accomplish retroinfection. Infective eggs can remain viable for 6 weeks. The cycle has been completed when the infective eggs are swallowed.

SYMPTOMS AND PATHOLOGY:

In most infections there are few or no clinical symptoms. The most common symptom is intense anal itching. Children may have shadows under eyes and loss of weight and appetite. Absorbed pinworm metabolites can cause mild toxemia. Exposed nerve endings where worms feed at the intestinal wall may cause nervousness, insomnia, nightmares, or convulsions. Other behavioral symptoms are restlessness, inattention, non-cooperation, hyperactivity, emotional instability, and urinary incontinence.

Mature worms can migrate back up to the stomach, esophagus, and nasal passages or cause intestinal blockage or appendicitis. The intense itching resulting after egg deposition can be painful. It has been reported that the severe itching can result in sexual disorders. Persistent scratching can lead to infection or liberate additional eggs by rupturing gravid females.

Worms can enter the vagina and continue migrating to the uterus or Fallopian tubes. This can cause a variety of symptoms which may include painful elimination, vaginal discharge, abdominal discomfort, chills, fever, or nausea, or chronic inflammation of the Fallopian tubes.

#### TRANSMISSION:

Pinworm infections are transmitted by the movement of eggs from anus to mouth. The most common method is by fingers after scratching or handling contaminated night clothes. Roommates recycle infections by spreading eggs from fingers to doorknobs, tabletops, sheets, etc. Eggs caught on the fur of cats and dogs sharing rugs, chairs, etc. are a source of infection. Airborne eggs from bedding and clothing can be inhaled and swallowed and cause light infections among many people from a single source. Female worms voided from the human body will die and liberate eggs into the air as their own bodies explode while drying.

#### DIAGNOSIS:

Eggs are the most important diagnostic sign of pinworm infection. Clear cellophane tape applied sticky side out to the anal area with a tongue depressor in the morning recovers eggs most efficiently. The tape can be stuck directly to a microscope slide for egg identification. Fecal smears and floatation methods may fail to reveal the presence of even a heavy infection because eggs are found in the feces of only 5% or fewer of infected persons.

Several daily anal tape-swabs may be needed to prove infection, since one worm leaving the body to deposit eggs may terminate an existing infection. Seven consecutive daily swabs should be taken in order to verify the absence of infection.

Adult worms are the second most important diagnostic sign. They may be found on the anal area at night or in feces after enemas. Worms found in feces or on children should be preserved in alcohol or vinegar and referred to a physician or public health clinic for identification.

#### TREATMENT AND PREVENTION:

If pinworm infection is suspected, a physician should be consulted. Treatment involves oral medication plus a sanitation program for the household. Personal hygiene is important. Pajamas should be of non-porous material to keep eggs from fingers and sheets. Clothing, sheets, pajamas, and underwear should be changed, boiled, and laundered everyday. Rugs, upholstered furniture, and drapes should be vacuumed and sunned. Fingernails should be kept short and scrubbed several times a day, especially before handling food. Toilet seats should be scrubbed daily. Toothbrushes should be protected from bathroom dust.

Eggs are resistant to disinfectants and putrefaction and are not killed by swimming pool chlorination. Fumigation by paradichlorobenzene, naphthalene, or hydrocyanic gas is relatively ineffective. Dry oven heat kills eggs on metallic and non-washable toys. Absolute alcohol kills eggs in 30 minutes. Sunlight and ultraviolet lamp radiation kills eggs.

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